

Then came the epoch-making discovery by Dr. Adler of the existence of alternations of generation—that a spring bisexual form was followed by an autumnal unisexual one, the two forms having totally different galls.

The volume commences with a list of the authors who have published separate works, and of the titles of the journals and transactions of scientific societies in which papers have appeared, the total number being 252, beginning with Malpighi in 1675. The titles of papers in magazines and transactions are not given. If they had we should have had the names of T. A. Marshall, E. A. Fitch, Prof. J. W. H. Trail, and other workers at British cecidology, besides the seven British authors given in the catalogue. We notice that while the list contains the French translation of Adler's papers, no mention is made of the English one by Mr. Standen. Next we have a "systematic index" of the genera and species, followed by the descriptions of the subfamilies, genera, and species, the whole concluding with a good index of the genera and species, but not of the plants, and a "Nomenclator generum et sub-generum." There are no figures of entire insects, but there are some illustrating the structure in the introduction, while there are 398 wood-cut illustrations of galls.

The authors divide the family into ten subfamilies and 126 genera, besides two doubtful ones; describe fully 1281 species, as well as 102 subspecies; in addition there are 212 species which have been too briefly described for recognition, and of which the original descriptions are reprinted. Some changes in generic nomenclature are made. *Allotria*, West., and *Xystus*, Htg., its synonym, are suppressed, both being pre-occupied. In place of them Dr. Kieffer adopts *Charips*, a MS. name of Haliday, first used by Marshall. The name of *Diplolepis* is revived after long disuse, it replacing *Dryophanta*. On the other hand Ashmead considers it to be the same as *Diastrophus*. The system of subgeneric names and trinomials for the species with well-marked varieties is adopted. Thus we have *Eucœla* and *Cothonaspis*, both with nine subgenera, the latter being genera with Foerster and Ashmead. This method, in some cases, leads to a species having four names, e.g. we have *Eucoila Psychacra Marshalli Marshalli* for the typical form of Cameron's species, and *Eucoila Psychacra Marshalli rufo-notata* for the variety.

An interesting fact in the biology of the parasitic Cynipidæ is that some species are found in ants' nests. Long ago Westwood bred *Charips victrix* from the rose aphid, and as many other species of the same genus have also been bred from plant-lice, it might fairly be concluded that the genus was a beneficial one. There is now, however, reason to believe that *Charips* is a hyperparasite, destroying, not the aphid, but the beneficial Braconid which preys on it. If that is so the species must be looked upon as injurious. The present writer has seen *Charips victrix* ovipositing in plant-lice killed by *Aphidius*, which pupates in the lice, the bodies of which become dried, inflated, and are attached to the leaf by the parasites. *Cothonaspis zig-zag* is another injurious hyperparasite, it destroying *Phora aetiae*, the para-

site of the injurious cutworm of the cotton. Among the habitats of the Parasitica is the sea-shore, where two British semiapterous species are found at high-water among seaweed.

It is curious how the Cynipidæ form their galls on certain plants more than on others. The oak in Europe and in North America is the predominant food-plant. In Europe *Quercus pedunculata* harbours ninety-nine species, *Q. pubescens* seventy-nine, and *Q. sessiliflora* ninety-six. After the oak come the Rosaceæ—*Rosa*, *Rubus*, *Potentilla*. The poppy has two species in the fruit and one in the stem. It is remarkable that the willows, on which there are so many dipterous and saw-fly galls, have not one species of Cynipidæ attached to them.

As regards the distribution, Dr. Kieffer gives some curious examples of the unequal manner in which some genera are distributed in Europe and North America. *Callirhytis* has four species in Europe, in America fifty-two. *Rhodites* has twelve Palearctic and seventeen Nearctic, while *Lytrohodites* is exclusively Nearctic, as is also *Amblybolyptus* with twenty-four species. A few species are found in Europe and North America, e.g. our "begeguar" and *Aulax latreillei* on *Glechoma hederacea* as in Europe, while *Rhodites eglanteriae* is recorded from the West Indies. *Solanum* should be deleted from the list of food-plants, it being now known that the galls of *Tribalia batatorium* came from the rose and not from the potato. Ashmead is no doubt correct in considering *Tribalia* to be identical with *Lytrohodites*.

There are one or two points in the work which concern our British species—*Aulax*, Hartig, is split up into two—*Aulax* (Kieffer retains the old, incorrect spelling, *Aylax*) with *latreillei*, Kief. (*glechomae* of Cameron's monograph), *hypochoeridis*, *papaveris*, *minor*, *scabiosae*, and *Fitchi*; and *Aulacidea* with *hieracii* and *graminis*. We doubt if *Cynips kollari*, our common "marble gall" fly, is dimorphic, and that *Andricus circulans* (a Turkey-oak species found in Britain only in Kew Gardens) is its sexual form. Our own experiments appear to show that it is agamic, while, if *A. circulans* were its sexual form, it surely should be equally common and as widely distributed.

In conclusion, we have to congratulate cecidologists on the appearance of this admirable and thorough work, which will be as useful to the beginner as to the advanced student in all parts of the world.

P. C.

THE CRYSTALLISATION MICROSCOPE.

Das Kristallisationsmikroskop und die damit gemachten entdeckungen insbesondere die der flüssigen Kristalle. By Prof. O. Lehmann. Pp. iv+112. (Braunschweig: F. Vieweg and Son, 1910.) Price 3 marks.

PROF. LEHMANN is gifted with the pen of a ready writer, and has in recent years poured forth such a voluminous stream of papers and books dealing with the subject of mobile crystals in its many aspects that considerable overlapping and repetition necessarily exists in them. Such criticism may be levied also against the present little book, which first

saw light in the pages of a *Festschrift*, issued by the Technische Hochschule in Carlsruhe, to commemorate the fifty-third birthday of the Grand Duke of Baden. It does, however, contain detailed descriptions of the latest forms of the microscope which have not appeared in print before, and would, moreover, be welcomed for the sake of the interesting historical account of Prof. Lehmann's researches, which spares the student of the subject the difficulty and trouble of hunting up a series of papers published at various dates and in various periodicals.

Nearly forty years have elapsed since Prof. Lehmann, while still a student, first devised a form of microscope by means of which substances could be observed at higher than ordinary room temperature, and the phenomenon of crystallisation watched in actual operation. The results of the research thereby rendered possible were, as is well known, unexpected and startling, and the meaning and even the reality of the observations were for long the subject of considerable discussion and dispute. Other workers have, however, in recent years entered the field, who on the whole have confirmed the accuracy of Prof. Lehmann's observations, and there can be no doubt but that the old ideas regarding crystals and crystallisation needed extensive modification. The investigations are discussed in chronological order in the present book, but since we noticed them less than two years ago (*NATURE*, 1909, vol. lxxix, p. 286), we shall not recur to them here. With each step some improvement in the instrument or some additional facility suggested itself until it reached the most recent form, which is provided with water jackets, powerful heating arrangement, means for reading the temperature, and a camera, and even a kinematograph, for giving a faithful record of the phenomena. The descriptions of the different forms are elucidated by excellent illustrations.

The last chapter of the book might with advantage have been omitted. Discussions of one's claim to priority of discovery, and the proper appraisal of one's work rarely serve a useful purpose, and are to be deprecated.

HEAT-ENGINES.

The Steam-Engine and other Heat-Engines. By Prof. J. A. Ewing, C.B., F.R.S. Third edition, revised and enlarged. Pp. xvii+604. (Cambridge: University Press, 1910.) Price 15s.

IN this, the third edition, Dr. Ewing has thoroughly revised his well-known text-book, and to some extent he has rewritten certain chapters; for example, the chapter on steam turbines is new, and the greater part of that devoted to gas and oil engines. The most important departure, however, is that in dealing with the properties of steam the author has accepted the characteristic equation of Callendar along with the steam tables derived from it by Mollier. The old steam tables were based chiefly on Regnault's well-known experiments, and it has been recognised that they involve inconsistencies and errors. Prof. Callendar, whose first paper on the subject was published in 1900, has devised a method of treatment

which is free from inconsistencies, and gives, when expressed in the form of tables, results which agree with all the most recent experiments, at any rate, between the temperatures of 0° C. and 200° C. Possibly Callendar's equation will not give such a close approximation to experimental results for pressures lying beyond the upper of these two limits of temperature. In the form of an appendix, Dr. Ewing has added a brief account of Callendar's characteristic equation, and of Mollier's readjustment of the constants. Dr. Ewing has also decided to adopt the Centigrade scale throughout the whole of his book.

In chapter v., which is devoted to entropy, the author describes Dr. Mollier's graphic methods of representing the properties of steam. By the aid of these diagrams the engineer has placed at his disposal a simple method of solving the problem of determining the state of steam which is expanded adiabatically from any initial condition whether superheated or not, and of determining the greatest theoretical output obtainable from steam when the initial condition and the lower limit of temperature are assigned.

Chapter viii., on steam turbines, is an entirely new chapter, and will be found of great assistance by all engineers who are interested in the design and working of the steam turbine. The whole subject of the design of the steam turbine is fully discussed both from the theoretical and from the practical side.

The last chapter is a new one on gas and oil engines. The efficiency of the ideal cycle is worked out on the assumption of constant specific heat, and the author then discusses the problem of the variation of specific heat with temperature, or in other words, the relation between the internal energy of the gas and its temperature, and discusses the effect of this variation upon the efficiency of the ideal engine working on the ordinary gas engine cycle.

In its present form Dr. Ewing's book will undoubtedly be the text-book most frequently consulted by all engineers who have to deal with steam and other forms of heat engines.

T. H. B.

GEOLOGICAL NATURE-STUDY.

The Earth and its Story. By Dr. A. R. Derryhouse. Pp. 364. (London: C. H. Kelly, n.d.) Price 5s. net.

THIS book has the same title, and covers the same ground, as one issued by Prof. A. Heilprin in 1896. What Heilprin did for young American readers, Dr. Derryhouse does, with even greater lucidity of expression, for beginners and unprofessional naturalists in the British Isles. His book is sent out by the publishers in good clear type, and is illustrated by photographs and maps printed in a brown tint on separate sheets of thick art paper. In this respect it has an advantage over all the elementary geological text-books that we know. Moreover, it is by no means a simple text-book. It is the work of a field-observer, who wishes to bring the results obtained by geologists home to any intelligent reader. Even fossil specimens are photographed, which gives them, for the author's purpose, a desirable air of reality, though the process will find less favour with